unprecedented rapidity. These fires continued to burn for about 10 days, when expert fire fighters were carried by aeroplane to strategic positions around the conflagrations. Cooler weather, accompanied by high relative humidity, aided the fighters in checking the fires. During six weeks the Forest Service expended $80,000 in combating forest fires in the national forests of California, most of them in the extreme northern portion of the State. If only 2 per cent of trees struck by lightning are ignited, as is stated in Forest Service Bulletin No. 111, there must have been a tremendous amount of electrical activity in the atmosphere over northern California during the summer of 1920.—*A. H. Palmer.*

A HOT SQUALL ON THE MAINE COAST.[1]

August 15, 1920, there was an unusual hot squall between 6 and 7 p. m. on the Maine coast at Ogunquit, York County, about 24 miles south of Portland, Me.

The weather had been peculiar for a week. On the coast there was a light east wind with cool air and much dense fog, while inland it was very hot and humid. Within observation from the beach great cumulo-nimbus clouds were observed every afternoon and heavy thunder was heard and lightning seen, but these disturbances on nearing the ocean were completely smothered by the cooler air. There was no rain on the ocean rim, but very heavy downpours fell inland only 20 miles, with severe lightning. And these disturbances invariably followed the rivers. The fishermen maintain that thunderstorms can not occur on the beach except at ebb tide, and this rule was not broken [nor verified]. For days the same localities got a drenching, while spots only a few miles away had not had a bit of rain for a month.

On August 15, at 6 p. m., the air on the beach was quite cool, about 62° F., with a light east wind. A heavy thunderstorm was visible about 20 miles north moving southeast. A black bank of clouds was observed coming from the north-northeast, and it rapidly approached, giving a blue-black sky. The clouds were mammato strato-cumulus, and on reaching the observer a moderately strong squall broke. The wind came from the northeast, from over the cold ocean, yet the temperature rose to 73° and it felt distinctly hot and very dry. The temperature remained at 73° for nearly an hour. The thunderstorm proper made off to sea in a southeasterly direction at some distance with a fine display of lightning. No rain fell on the beach, nor did the lightning get any nearer. Two days later, when a northeast wind of the same velocity was blowing, the temperature registered 58°. It seems as if this hot squall must have been a down-draft, differing from the usual cool squall possibly through having insufficient evaporating rain to keep the descending air cool.[2] The same kind of a squall in a milder form took place the next evening about the same time.—*R. M. Dole.*

[1] Cf. MONTHLY WEATHER REVIEW, Aug. 1919, 47: 566–567.

[2] See ibid., July, 1914, 42: 364; or *Jour. Franklin Inst.*, July, 1918, 186: 63–64 (W. J. Humphreys).

NOTES ON CLOUD PHOTOGRAPHY.[1]

By WILLIAM S. DAVIS.

[Orient, N. Y., May 25, 1920.]

The accompanying cloud studies were made at Orient, a village located upon the small peninsula forming the east end of the north fork of Long Island, N. Y. Because of the small land area in comparison with that of the surrounding waters of Long Island Sound, Gardiners Bay, and Orient Harbor, the air currents at low elevations are less affected by local conditions upon the ground than would be the case in most sections, especially those removed from the coast.

In regard to the best method of photographing clouds, my experience leads me to advise the use of color-sensitive emulsions at all times, and in combination with a suitable ray filter when color is an important factor. If plates, rather than films, are employed the double-coated "nonhalation" variety will permit more latitude in exposure than the single-coated kind, though either can be used successfully if proper care is exercised to avoid overexposure upon delicate cloud forms.

When exposing on gray clouds there is little if anything to be gained by placing a ray filter on the lens, unless one is aiming to secure a good rendering of landscape at the same time. In this case, a filter generally helps to equalize tonal differences between sky and foreground sufficiently to allow of timing the exposure for the latter without loss of quality in the sky.

White clouds against a blue sky always call for the use of a ray filter to secure the best possible results, as is also the case when dealing with a brilliant sunset to better preserve the relative visual luminosity of the different colors. For general use a ray filter of moderate depth of yellow will be found sufficient, representative ones of this class being the Ingento series A, Cramer Isos II, and Wratten K1. To secure for study purposes the clearest rendering of very thin filmy clouds, such as certain types of cirrus, however, it is advisable to employ considerably stronger colored filters to emphasize the slight contrast between the clouds and sky. The same applies in the matter of preserving the luminous effect of deep yellow and orange tints in a gorgeous sunset sky. Here is where such a filter as the Ingento B (or the C series for still more contrast), Wratten K2 series, or Isos III will prove helpful.

When timing exposures for clouds alone, without regard to any land shown below, one-fourth the time usually allowed an open landscape will be found approximately correct for well-defined cloud masses, but very delicate white clouds would need still less comparative exposure, followed by longer time of development than usual in a solution well restrained with potassium bromide.

As a rough guide for a beginner, it may be stated that when using plates similar in speed to the Cramer "Inst. Iso" an exposure of one-fiftieth second without a ray filter would be close to the mark for bold masses of gray cloud in summer light, with the lens stopped to F. 16. Using the same sized stop, and a light yellow ray filter over the lens, from one-fifth to one-tenth second could be given upon white clouds in good sunlight, though a longer time could be allowed without harm when the tonal contrasts are well defined. All these exposures should be increased in early morning or near sunset, and in the weaker actinic light during the winter season.

[1] *See also* A. J. Henry: Cloud photography. MONTHLY WEATHER REVIEW. May, 1895, 23:169–171, 255. In this article the use of a liquid filter is described. See also for a cut of the apparatus as used *Scientific American* 72:137, March 2, 1895. The use of orthochromatic photographic plates, a developer strong in the reducing agent and highly restrained is recommended.

Much trouble from fogging of the negative by halation or sunshine entering the lens will be prevented by employing some kind of a lens shade to cut off all rays of light outside the view angle of the lens. This is especially important when working against the light.

APPARATUS AND METHODS FOR CLOUD PHOTOGRAPHY.

By ARTHUR J. WEED, Chief Instrument Maker.[1]

[Weather Bureau, Washington, July 24, 1920.]

SYNOPSIS.

The first requisite for cloud photography is a good camera with a very rigid support. To this equipment a ray filter or black mirror is a necessary adjunct in order to cut out the actinic light of the blue sky and render, in the finished print, white clouds on a dark background. Certain forms of clouds may be successfully photographed with a light bellows camera, but since many of the most interesting clouds are accompanied by high winds, a much more stable camera, such as the box type, on a permanent support is desirable. This should be so mounted as to cover the full sweep of the horizon and from the horizon to the zenith. The apparatus used at Mount Weather is fully described. Expensive apparatus is not necessary to attain excellent success in cloud photography.—*H. L.*

The first requisite in cloud photography is a good camera for that special purpose. Not necessarily an expensive apparatus, but one that is rigid and has the necessary means of attachment to a firm support.

A suitable ray filter, or black mirror, is necessary to cut out the actinic light of the blue sky and render, in the finished print, white clouds on a dark background just as we see them on a darker background of blue.

Excellent pictures may be made of certain types of clouds with a light bellows camera, when it is sheltered from the wind, but if one wishes to do really good work this will be found too light and shaky for the purpose, as some of our most interesting clouds occur only when a strong wind is blowing.

In order to get an unobstructed view, means should be provided for mounting the camera on the highest possible elevation like the top of a hill or the roof of a building.

Figure 1 (on plate facing p. 456) shows a camera built by the writer at Mount Weather Observatory. This was mounted on the roof of the Physical Laboratory.

Two permanent mountings were required for a full sweep of the horizon, each of which consisted of a piece of yellow pine timber 3 by 4 inches, the upper end turned to a diameter of about 3 inches. These turned portions of the posts were shellacked and when not in use were protected by metal covers made from pieces of tubing with a head soldered into one end.

The method of attaching the post to the metal railing is shown in figure 1.

The holder for the camera consisted of a tube to fit over the turned wood post, a frame to hold the bed of the camera, and two braces by which the vertical adjustments were made.

The tube was a piece of conduit pipe used to protect underground electric wires. To the top of the tube was secured a crosspiece of wood, and to this was hinged one end of the frame carrying the camera bed. To the other end of the frame two round metal braces were attached by hinges.

The tube was sawed open from the bottom for about one-half its length and a U-shaped strap of brass was placed around it. Through the free ends of this brass strap a bolt was inserted on which were two pairs of thick washers, each pair grooved to hold one of the metal braces of the frame. The bolt was provided with a large milled head nut. When this nut was tightened the camera was firmly secured both vertically and horizontally.

The frame was constructed so that the bed of the camera slid in between the two side rails where it was secured in position by four large-headed brass bolts provided with milled head nuts. The heads of these bolts gripped the edge of the camera bed.

This frame could be swung around on the post and had a vertical movement of 90°.

The construction of this portion of the apparatus can be seen in figure 1.

The camera consisted of a bed or frame, made from a piece of maple flooring, on which was mounted two wooden boxes painted a dead black on the inside and constructed of the proper size to telescope together readily.

The outer box was screwed to the camera bed and the front end of the inner box was secured to a maple frame having an L-shaped extension which was fitted to slide on the maple bed. This frame carried the lens board.

The arbitrary sizes to be followed in constructing such a camera are that the combined length of the two boxes

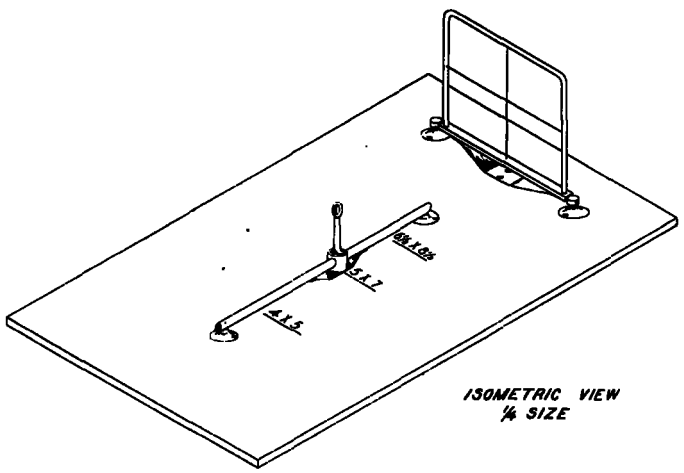

FIG. 2.—View finder for different sized pictures.

plus the lap where they slide together shall equal the focal length of the lens it is desired to use. Also the outer box must conform to the size of the plate holder used so that a light trap can be arranged.

In this particular camera a groove was made at the top and bottom of the rear end of the outer box a little wider than the thickness of the plate holder, and a flat spring was fastened in the outer edge of each groove which forced the plate holder against the end of the camera box.

The ground-glass focusing screen was mounted in a frame corresponding in size to the plate holder and had to be removed before inserting the holder. In figure 1 this frame and screen are shown in position.

When only one lens is to be used with such a camera the two boxes can be adjusted to get the proper focus of a distant object on the ground glass and then firmly secured to the bed at that point.

The only use for the focusing screen thereafter is to see just how much of the view will appear in the picture.

For quick work a special view finder was made and attached to the camera. This was in two parts, as shown in figure 2.

A rectangular frame proportional to the size of the plate to be used was mounted on the top of the camera box and had both a vertical and a horizontal wire

[1] Since Sept. 1, 1920, Mechanician, Rouss Physical Laboratory, University of Virginia.